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# Report Documentation Page

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An X-47B Unmanned Combat Air System (UCAS) demonstrator flies near the aircraft carrier USS *George H.W. Bush* (CVN 77), the first aircraft carrier to successfully catapult launch an unmanned aircraft from its flight deck.
*U.S. Navy photo by Erik Hildebrandt.*

# Scheduling and SVTs

## Rx for Efficiency

*Lynnetta Babuchiwski* ■ *Matthew Wilkinson*
*Kelli Coon* ■ *Mike Kotzian* ■ *Duane Mallicoat*

Even though Benjamin Franklin first voiced this well-known adage in the 1700s, the message remains relevant in today's time of increased program scrutiny. For acquisition programs, the relevancy is clear as a program's "health" is assessed continually across four interdependent factors: cost, schedule, performance and risk. In the context of Franklin's adage, a program office measures "time" through the schedule factor.

### A Time of Increased Focus

While scheduling has been a foundational factor for program evaluation, a series of new initiatives over the past several years has brought scheduling to the forefront of defense acquisition.

In September 2010, the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD[AT&L]) released its Better Buying Power (BBP) guidance that outlined "twenty three principal actions to improve efficiency." One of these principal actions specifically focused on scheduling: "Set shorter program timelines and manage to them."

In April 2011, the National Defense Industrial Association published the *Planning & Scheduling Excellence Guide v2.0* (PASEG), which laid the foundation for Generally Accepted Scheduling Principles (GASP)—eight overarching tenets for building, maintaining and using schedules as effective management tools.

In May 2012, the Government Accountability Office (GAO) published its *GAO Schedule Assessment Guide: Best Practices for Project Schedules* (GAO-12-120G), defining the top 10 best practices to follow in scheduling. In July 2012, the Office of Performance Assessments and

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An X-47B Unmanned Combat Air System (UCAS) demonstrator completes an arrested landing on the flight deck of the aircraft carrier USS *George H.W. Bush* (CVN 77). The landing marks the first time any unmanned aircraft has completed an arrested landing at sea. *U.S. Navy photo by MC3 Kevin J. Steinberg.*

Root Cause Analysis (PARCA) within OUSD(AT&L) released a new Integrated Program Management Report Data Item Description (IPMR DID) for future contract awards over $20 million. This new DID replaced the previously separate DIDs for Contract Performance Report (CPR) and Integrated Master Schedule (IMS). While contracts meeting Earned Value Management (EVM) thresholds generally contained the CPR DID, the IMS DID sometimes was forgotten in the rush to award a contract. To ensure the vital IMS is included, the IPMR DID combined the two.

So, why is there an increased focus on scheduling? Simply put, scheduling considers all aspects of a project for appropriate evaluation during planning and execution. As with any complex endeavor, a systematic approach is the best way to capture all aspects. Think of how the process-oriented systems-engineering approach became a cornerstone of DoD Instruction 5000.02 (*Operation of the Defense Acquisition System)* dated Dec. 8, 2008. The ability to follow a well-understood and consistent approach reduces the risk of failure and gives confidence to the team by identifying a clear path forward from which a program can manage expectations successfully. Incorporating a systematic approach to scheduling provides similar benefits. Programs that do not manage to timelines established through a systematic process often result in substantial cost growth and late delivery to the warfighter.

Substantial DoD budgets over the last decade may have allowed programs to recover more easily from schedule impacts, but such is not the case in today's fiscal environment of decreasing budgets and increased attention to program progress and affordability.

## Scheduling Premise

A schedule is essential for government acquisition programs because it provides a roadmap for systematic project execution. Additionally, a schedule is the main source to measure program progress; it quickly identifies and resolves potential program timing issues and ensures accountability at all levels. It provides a time sequence for the duration of all program activities and aids in the understanding of those activities that drive the schedule. Using the schedule, everyone understands when the major milestones will occur. If the program requires EVM, then a program schedule also is a vehicle for developing a time-phased budget baseline. Furthermore, it is an indispensable basis for managing tradeoffs between cost, schedule, performance and risk. Program management can compare possible sequences of activities, determine how resource availability affects the work, identify contingency plans to mitigate risk and predict the consequences of managerial action or inaction on events. Inevitably, program changes occur, and a systematically developed and managed schedule can forecast the effects of delayed, deleted and added scope, as well as opportunities for recovery. In this manner, schedules can verify and validate the impact of proposed modifications against the planned time to complete. A program simply cannot be successful without an integrated and reliable schedule that defines when and how long work will occur, and how each activity relates to the others.

Typically, two simultaneously developed program schedules gain the most visibility: the prime contractor's IMS and the government's integrated government schedule (IGS). They are built from different perspectives and reflect different priorities

Unmanned Combat Air System (UCAS) demonstrator launches from the aircraft carrier USS *George H.W. Bush* (CVN 77) after completing its first arrested landing on the flight deck of an aircraft carrier. *U.S. Navy photo by MC3 Christopher A. Liaghat.*

and details. Whereas the prime contractor develops and manages its own IMS to track milestones and activities for which the contractor is responsible and accountable, the government focuses on its tasks to ensure a successful program (e.g., contracting activities, acquisition documentation, systems' engineering processes, logistics, GFE, test and evaluation). However, both are built using standard scheduling practices, including subcontractor efforts and work breakdown structure (WBS) levels. Decomposition of the WBS to the lowest level necessary for planning and execution helps organize and define the project's total work scope—including consideration of resources, materials and time.

## Challenges in Developing a Schedule

From a general scheduling perspective, many challenges are associated with developing a program schedule. While each scheduler's challenges vary, the following list, though not comprehensive, represents some common scheduling challenges.

- **Capture all activities**: Reflect all activities (steps, events, outcomes and other factors) as defined in the program's WBS.
- **Sequence all events**: Logically sequence activities in the order in which they would be executed.
- **Assign resources to all activities**: Realistically reflect resource (labor and materials) needs, and funding or time constraints.
- **Establish a realistic duration of all activities**: Reflect how long each activity will take to execute, taking care to keep from underestimating the duration of activities, especially when complex or technically challenging.
- **Establish the critical path for all activities**: The critical path (i.e., sequence of discrete tasks/activities that has the longest total duration and the least float/slack) should be identified.
- **Identify reasonable "float"**: Understand the time that an activity can slip before the delay impacts contract completion or a constraint date.
- **Conduct a schedule risk analysis**: Predict the level of confidence in meeting a project's completion date, calculate the contingency time needed for a level of confidence and identify high-priority risks.
- **Update the schedule**: Use logic and durations to reflect realistic start and completion dates for project activities, and continually monitor to forecast completion dates differing from planned dates.

Alternatively, a scheduler could appreciate these scheduling challenges as "best practices." That is, programs that successfully resolve or avoid the above scheduling challenges are, in effect, implementing a best practices approach to develop a realistic, systematic program schedule.

## Integrating Government and Contractor Schedules

We now expand our schedule discussion to the program office, which executes day-to-day acquisition-related activities. As almost everyone realizes, the program office is "ground zero" for formulating a program schedule. While each acquisition program office develops a program schedule, the quality of each program schedule is not necessarily the same. As stated in GAO-12-120G, "a program's success depends in part on the quality of its schedule. A well-formulated schedule can help

analyze how change affects the program." Hence, simply having a program schedule is not enough. The program office must put in the effort to produce a quality schedule from the very beginning in order to use the schedule as a fundamental management tool in balancing cost, schedule, performance and risk.

As an example of a program office successfully managing schedule issues, we introduce Naval Air Systems Command's (NAVAIR) Program Management Air (PMA)–268 program office responsible for the Navy's Unmanned Combat Air System (UCAS) Aircraft Carrier Demonstration (UCAS-D) program. PMA-268's mission is to mature technologies for a carrier-suitable, low observable-relevant, unmanned air system while reducing risk for carrier integration, and developing the critical data necessary to support potential follow-on acquisition programs. Northrop Grumman Corp. is the prime contractor for the X-47B air vehicle—and the government is the lead integrator for the carrier systems, the landing system and associated software and testing.

Early on, PMA-268 made the logical decision that it wanted to develop an integrated schedule incorporating the government and contractor's work. The resultant, integrated schedule would be a foundational tool to develop the contractor's Performance Measurement Baseline (PMB), which is a total, time-phased budget plan to measure against program performance. Budgets assigned to the scheduled control accounts and to higher-level contract WBS elements, applicable indirect budgets, and undistributed budgets form the PMB budget plan. The PMB is one of a program manager's principal tools for measuring project performance.

PMA-268 quickly realized the challenges of integrating the government's work and Northrop Grumman's IMS into an overarching program IGS. To accomplish this schedule integration effort, PMA-268 utilized NAVAIR's competency aligned organizational structure and enlisted the help of an in-house schedule expert. Matthew Wilkinson, the NAVAIR-4.2.3 (Integrated Project Management Division) schedule expert assigned to PMA-268, noted: "The most difficult aspect of developing an integrated program schedule is uniting different schedules built from different perspectives while bolstering team confidence and relevance in the overarching program schedule."

When integrating the government and prime contractor schedules, the traditional method mostly is manual. Often a program office receives a contractor's IMS and picks milestone dates out of that contractor's schedule to input into the program office's schedule. This becomes a very tedious and manual process and, often, not a true up-to-date reflection of the timeline. In the case of PMA-268, Lynnetta Babuchiwski, PMA-268 operations deputy, remarked that the integration process revealed there was a "struggle with a true, clear picture of the government schedule integrated with the contractor schedule."

**Inevitably, program changes occur, and a systematically developed and managed schedule can forecast the effects of delayed, deleted, and added scope, as well as opportunities for recovery.**

Enter a technique called Schedule Visibility Tasks (SVTs).

## A New Scheduling Technique

So what are SVTs? SVTs are tasks, activities or milestones in the IMS that increase management visibility and functionality of the schedule for non-PMB related items. They are specifically structured to improve visibility across, and maintain schedule accountability between, organizations with separate schedules.

SVTs are tasks with no resources assigned and are included in the IMS to characterize potential impacts to the logic-driven network. Typically, these unbudgeted tasks represent non-PMB related items such as lead time for purchased parts or government activities. Within multiple organizations with differing goals, SVTs are a very powerful tool to align schedule incentives across an integrated team with complex interrelationships. In short, SVTs clearly illustrate how to get "from here to there."

The IPMPR DID mentioned previously stated that SVTs "shall not be used to represent any scope within the PMB. Resources cannot be assigned to SVTs, nor shall they be used to assess earned value performance. Any SVT shall be identified with the title 'SVT.' "

So why does this matter? At first glance, this sounds like a way to pad a schedule and produce a buffer, but that is not the intent of SVTs. Following a systematic process, SVTs can be a valuable tool for both the government program office and the contractor. For PMA-268, SVTs were discussed and decided upon cooperatively, based on a "one team" approach between contractor and government. This collaborative process provided insights from both the government and contractor perspectives, emphasizing a key result of SVTs —schedule confidence with team "buy in."

## Incorporating SVTs

As a first step to incorporate SVTs into the PMA-268 IGS, Wilkinson developed a documented process for the program office to follow. This process included how the program office would maintain the established IGS baseline and provide input to the schedule, as well as the frequency of status meetings with Northrop Grumman. Once this documented process was in place, Wilkinson set forth identifying the work to go in the IGS, with the help of the program office. This required Wilkinson to understand the right questions of the program office and capture SVTs that would make a difference. This took approximately 1 month for initial grounding (e.g., capture the work and understand its associations) and 3 months to lay the work into the schedule.

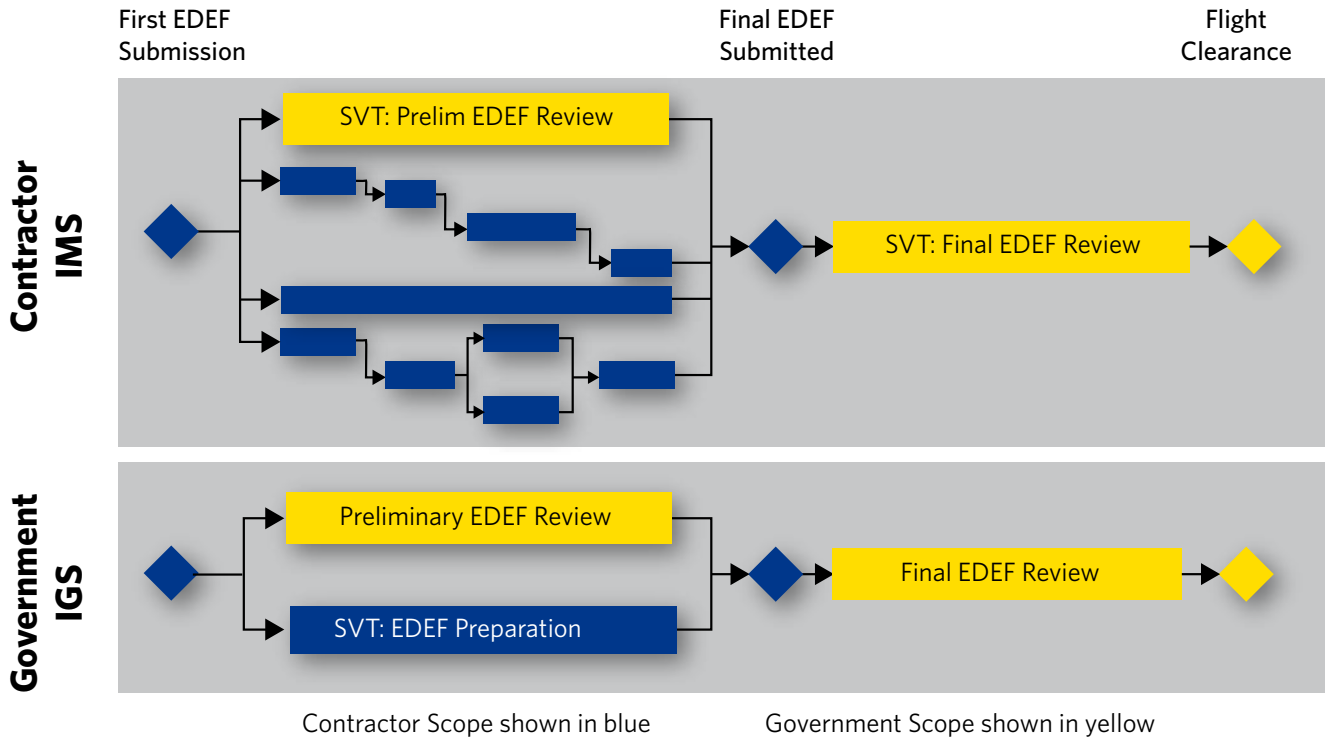
The IGS contained the SVTs and the assigned durations for each, as agreed by the government and contractor in joint meetings. After initial SVT development by the government team, a face-to-face meeting at Northrop Grumman finalized the program's SVTs. As a result, everyone involved understood how the work was associated and determined clear lines of accountability. Standing weekly meetings gave the team a clear view of upcoming tasks, quick identification of issues and risks, and whether mitigation was needed.

Figure 1 provides a graphic example of an SVT as part of the government's IGS. This PMA-268 example illustrates engineering documents (EDEFs) being reviewed in preparation for a Flight Clearance. This is a large, complex process with many EDEF presentations, reviews, and back-and-forth interim submissions. In general, this tasking is too complex and dynamic to represent each EDEF in a program schedule. SVTs provide a means to manage this effort and maintain integration and proper accountability between the contractor's IMS and the government's IGS.

SVTs manage and simplify the complex back-and-forth EDEF preparation and preliminary review. In this example, the contractor prepares and submits the EDEFs (shown as blue rectangles in the IMS and reflected in the IGS as "SVT: EDEF Preparation"). With the EDEF preparation, the government concurrently is providing preliminary EDEF reviews (shown as a yellow rectangle in the IGS and reflected in the IMS as "SVT: Prelim EDEF Review").

SVTs also maintain integration and visibility. Going back to the PMA-268 example, after all EDEFs are submitted and before Flight Clearance release, the government performs "Final EDEF Review," which is reflected in the contractor's IMS to maintain visibility of the government work and promote realistic forecasting, good post-flight clearance resource management, as well as a "one team" concept with clear roles and responsibilities. However, if the final EDEF is submitted late or the review is delayed, the "SVT: Final EDEF Review" will ensure the resultant impact to the flight clearance date is made apparent to program management for mitigation.

*Figure 1: Graphic Example of Schedule Visibility Tasks (SVTs)*



## Improved Efficiencies

With the introduction of SVTs when integrating the PMA-268 and Northrop Grumman schedules, several schedule—and program—efficiencies resulted.

The program's vision was crystalized and the overall integrated schedule was clarified, improving management efficiency within the program office. This also helped Northrop Grumman better understand the government's expectations, creating program efficiencies on the part of the contractor. SVTs helped create a picture of how everything was associated.

SVTs allowed everyone to stay focused on the work, not personalities. The SVTs enhanced communication and accountability to the teams. This modest process clarified expectations and established clear lines of accountability based on the schedule data available prior to execution.

With an established process, transition during workforce turnover was simplified and team cohesiveness strengthened. And, as a result, trust between the government and the contractor provided realistic forecasting of dates.

## Summary

PMA-268's use of SVTs was critical to developing a "one team" concept between the government and the contractor. While not the only factor, SVTs helped PMA-268 and Northrop Grumman become a truly integrated team, characterized by rapid communication and personal accountability. The team's focus was on accomplishing the necessary work tasks without the finger-pointing and emotionalism that can sometimes plague a program with cost, schedule, performance and risk challenges. Capt. Jaime Engdahl, the PMA-268 program manager, summed up the benefit of incorporating SVTs into the PMA-268 scheduling process by remarking that "SVTs helped facilitate leadership at all levels, from both the government and contractor sides, to become committed to a 'one team' concept. Everyone was pulling together and clearly understood their respective role and responsibility. With a program as complex as UCAS-D, this turned out to be a huge force multiplier."

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